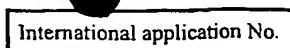
PATENT COOPERATION TREATY



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

	for a least form	(I CI MILICIE 3	and Rule 70)	
eggin (Applicant's or agent's file reference	FOR FURTHER ACT	II IN	eation of Transmittal of International Examination Report (Form PCT/IPEA/416)
	International application No.	International filing date		Priority date (day/month/year)
3835	PCT/EP2003/008199	25 July 2003 (2	5.07.2003)	26 July 2002 (26.07.2002)
****	থট্টালেম্বাonal Patent Classification (IPC) or na C12P 23/00	tional classification and l	PC.	
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	Applicant	BASF AKTIENGE	SELLSCHAFT	
	1. This international preliminary examinant and is transmitted to the applicant accounts.		epared by this Intern	ational Preliminary Examining Authority
	2. This REPORT consists of a total of	5 sheets, ir	cluding this cover s	heet.
		this report and/or sheets	containing rectifica	on, claims and/or drawings which have been tions made before this Authority (see Rule
	These annexes consist of a tot	al ofshe	eets.	
	3. This report contains indications relate	ing to the following item:	5:	
	I Basis of the report			
	II Priority			
	III Non-establishment o	f opinion with regard to r	novelty, inventive ste	ep and industrial applicability
	IV Lack of unity of inve	ention		
	V Reasoned statement citations and explana	under Article 35(2) with a standard supporting such standard stand	regard to novelty, in tement	ventive step or industrial applicability;
	VI Certain documents c	ited		
	VII Certain defects in the	e international application	1	
	VIII Certain observations	on the international appl	ication	•
		<u> </u>	······································	
	Date of submission of the demand]	Date of completion of	of this report
	25 February 2004 (25.02	2.2004)	10 De	cember 2004 (10.12.2004)
	Name and mailing address of the IPEA/EP	4	Authorized officer	
ļ	Facsimile No.		Telephone No.	



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

PCT/EP2003/008199

pages	l. Basis	of the re	port
the description: pages	l. With	regard to	the elements of the international application:*
the description: pages		the inte	mational application as originally filed
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the claims: pages		•	
the claims: pages			
pages	الحسكا		
pages	X	the cla	
pages 1-19 , filed with the letter of 05 October 2004 (05.10.2004)		pages	, as originally filed
the drawings: pages 1/5-5/5		pages	
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THE PRINTER SHEET CHIMICALLY AND A CAMBILLAND AND AND AND AND AND AND AND AND AND			want sheet containing such amendments must be referred to under item 1 and annexed to this report
			

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP 03/08199

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ovelty (N)	Claims	1-19	YES
•	Claims	·	NO
. iventive step (IS)	Claims	1-19	YES
	Claims		NO
eductrial applicability (IA)	Claims	1-19	YES
ndustrial applicability (IA)	Claims	1-19	

2. Citations and explanations

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- 1. Reference is made to the following documents:
 - D1: SCHOEFS A B B et al.: "Astaxanthin accumulation in Haematococcus requires a cytochrome P450 hydroxylase and an active synthesis of fatty acids", FEBS LETTERS, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, NL, Vol. 500, No. 3, 6 July 2001 (2001-07-06), pages 125-128, XP004251391, ISSN 0014-5793
 - D2: US 2002/051998 A1 (SCHMIDT-DANNERT CLAUDIA et al.), 2 May 2002 (2002-05-02)
 - D3: DE 100 51 175 A (BASF AG), 2 May 2002 (2002-05-02)
 - D4: SCHMIDT-DANNERT CLAUDIA: "Engineering novel carotenoids in microorganisms", CURRENT OPINION IN BIOTECHNOLOGY, Vol. 11, No. 3, June 2000 (2000-06), pages 255-261, XP002261192, ISSN 0958-1669
- The amendments submitted with the letter of 5 October 2004 meet the requirements of PCT Article 34(2)(b).
- 3.1 Document D1 discloses the oxidation of β -carotene to a staxanthin in Haematococcus and provides evidence that cytochrome P450 is involved in the oxidation process.



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- 3.2 Document D2 shows that the bacterial monooxygenases cytochrome P450 BM3 and P450CAM (not from *Thermus sp.*) can be used to oxidise various metabolites, such as carotenoids and terpenoids.
- Document D3 discloses the isolation and cloning of the CYP175A1 cytochrome P450 gene from Thermus thermophilus. Various possible substrates for the cytochrome P450 monooxygenases are disclosed, such as ionones, which are terpene compounds; however, there is no mention of carotenoids.
- 3.4 Document D4 discloses the engineering of carotenoid biosynthesis enzymes and discusses the assembling of various of these (crt) genes to generate new metabolic pathways. Cytochrome P450 enzymes from Thermus sp. are not disclosed.
- 4.1 Taking D3 to be the closest prior art, the problem addressed by the present invention is that of providing a new use for the enzyme from Thermus sp.
- The solution to the problem involves the oxidation of carotenoid substrates, and is not obvious because it is not apparent to a person skilled in the art, either from D3 alone or from a combination of D3 with D1, D2 or D4, that carotenoids can be substrates for the P450 cytochrome monooxygenase isolated from Thermus sp.
- Claims 1 to 19 therefore meet the requirements of novelty, inventive step and industrial applicability (PCT Article 33(2), 33(3) and 33(4)).